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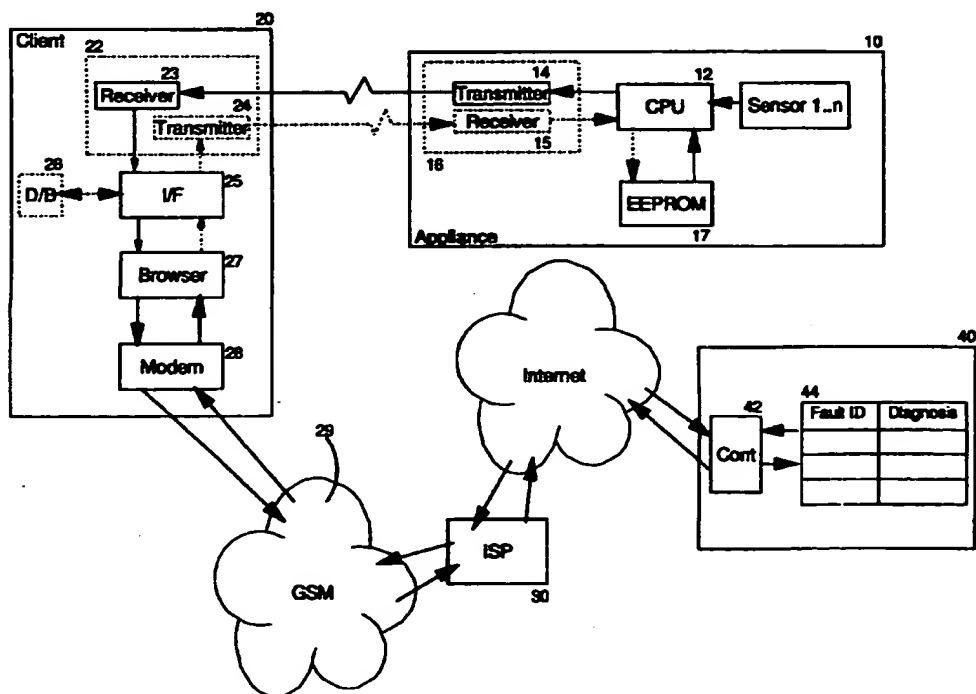
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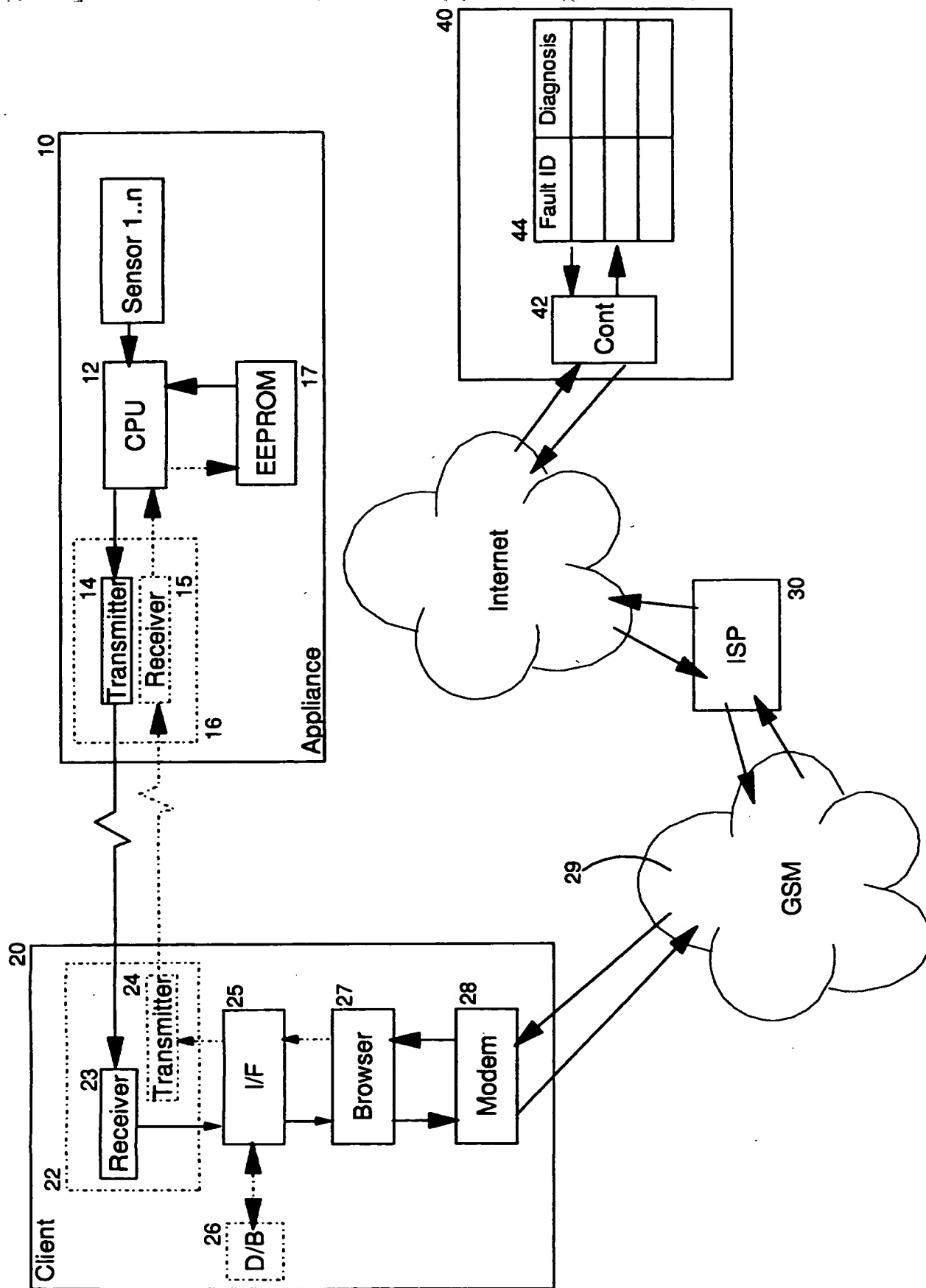
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(54) Abstract Title  
Diagnostic system

(57) A diagnostic system for an appliance (10) comprises a device (20) adapted to receive input data from the appliance. The input data defines a status of the appliance such as a fault identity. The device includes means (25, 26) adapted to generate a network address (URL) from said input data and means (27) adapted to establish a connection to said network address to retrieve stored information associated with the status of the appliance from said network address and to present said information.



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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.P): G4A (AUIDB), H4P (PEUX)  
Int CI (Ed.6): G06F  
Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
	None	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

**DIAGNOSTIC SYSTEM****Field of the Invention**

5           The present invention relates to a diagnostic system and method of performing a fault diagnosis for an appliance.

**Background of the Invention**

10           Appliances such as video recorders, televisions and audio systems are becoming increasingly complex and difficult to service. Such appliances are usually controlled by a central processor which could gather status or condition information in relation to various components of the appliance either through discrete sensors or by monitoring the  
15           status of software running on the processor. However, these appliances are not usually designed to actively communicate with technicians when a fault occurs, and so little use is made of this status information.

20           On the other hand, appliances such as alarm or fire panels are usually equipped with small displays to allow the processor to display error messages or status information. These displays are usually small and, as such, the information displayed can tend to be obscure and difficult for a less experienced technician to interpret.

25           Thus, a technician who may be servicing many different types of appliances in one day may need to carry large amounts of documentation in order to help diagnose and repair appliances. This documentation can be cumbersome, and suffers from the drawback that it is difficult to keep paper documentation up to date and paper documentation tends to lack  
30           interactivity which could help in fault diagnosis.

          The Worldwide Web (WWW) is one of the facilities provided via the Internet. The WWW comprises many pages or files of information, distributed across many different servers. Each page is identified by an  
35           individual address or Universal Resource Locator (URL). Each URL denotes both a server machine, and a particular file or page on that machine. There may be many pages or URLs resident on a single server.

40           Typically, to utilise the WWW, a user runs a computer program called a Web browser on a client computer system such as a personal computer. Examples of widely available Web browsers include the

"WebExplorer" Web browser provided by International Business Machines Corporation in the OS/2 Operating System software, or the "Navigator" Web browser available from Netscape Communications Corporation. The user interacts with the Web browser to select a particular URL. The interaction causes the browser to send a request for the page or file identified in selected URL to the server identified in the selected URL. Typically, the server responds to the request by retrieving the requested page, and transmitting the data for that page back to the requesting client. The client-server interaction is usually performed in accordance with a protocol called the hypertext transfer protocol ("http"). The page information received by the client is then presented to the user. This presentation of information depends on the type of content of the page information as explained below.

WWW pages are typically formatted in accordance with a computer programming language known as hypertext mark-up language ("html"). Thus a typically WWW page includes text together with embedded formatting commands, referred to as tags, that can be employed to control for example font style, font size, lay-out etc. The Web browser parses the HTML script in order to display the text in accordance with the specified format. In addition, an html page also contain a reference, in terms of another URL, to a portion of multimedia data such as an image, video segment, or audio file. The Web Browser responds to such a reference by retrieving and displaying or playing the multimedia data. Alternatively, the multimedia data may reside on its own WWW page, without surrounding html text.

Most WWW pages also contain one or more references to other WWW pages, which need not reside on the same server as the original page. Such references may be activated by the user selecting particular locations on the screen, typically by clicking a mouse control button. These references or locations are known as hyperlinks, and are typically flagged by the web browser in a particular manner. For example, any text associated with a hyperlink may be displayed in a different colour. If a user selects the hyperlinked text, then the referenced page is retrieved and replaces the currently displayed page.

Further information about html and the WWW can be found in "World Wide Web and HTML" by Douglas McArthur , p18-26 in Dr Dobbs Journal, December 1994, and in "The HTML SourceBook" by Ian Graham, John Wiley, New York, 1995.

## Disclosure of the Invention

5       The present invention provides a diagnostic system for an appliance comprising a device adapted to receive input data from an appliance, said input data defining a status of the appliance, the device including means adapted to generate a network address from said input data and means adapted to establish a connection to said network address, to retrieve information associated with the status of the appliance from said network address and to present said information.

10       In a second aspect the invention provides an appliance cooperable with the diagnostic system of the invention.

15       In a third aspect the invention provides a web server cooperable with the diagnostic system of the invention and comprising a database adapted to store a plurality of objects, each object being indexed by a key related to the status of the appliance and including an attribute comprising information relating to the status of the appliance.

20       In a fourth aspect, the invention provides a method of diagnosing a fault in an appliance comprising the steps of: receiving input data defining a status of the appliance; generating a network address from said input data; establishing a connection to said network address; retrieving information associated with the status of the appliance from said network address; and presenting said information.

25       In a fifth aspect the invention provides an interface module for an appliance diagnostic system, said module being adapted to receive input data from an appliance, said input data defining a status of the appliance, the interface module being adapted to generate a network address from said input data and to launch a connection to said network address so that information associated with the status of the appliance can be retrieved from said network address and presented.

30       The present invention makes available a diagnostic system whereby an identifiable condition or status of an appliance is associated with an URL address at which information that: describes the status or condition of the appliance; provides information for reporting or maintenance purposes; provides a means for feedback; or shows links to further sources of information is stored.

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The invention relies on relatively inexpensive components that may be incorporated in a variety of appliances to provide a simple means of providing immediate feedback of relevant information to a technician. This information is easily maintained and becomes immediately available to all technicians world-wide.

The term appliance need not be limited to a self-contained device. There are many possible applications of the invention, a few of which, are described below:

In medical diagnosis, in particular, home diagnostic systems that are connected to blood pressure, heart rate and lung capacity sensors as well as urine sample analysers etc.

Items of equipment such as photocopiers, cars etc that increasingly include self diagnostic systems.

Fire alarms including sensors that detect heat or smoke in a particular location in a large office block could, for example, trigger appropriate Web-pages for display on information screens or local terminals providing information and directions for the safest way to vacate the building from that point.

#### Description of the Preferred Embodiment

Embodiments of the present invention will now be described with reference to the accompanying drawing, which is a schematic diagram of a diagnostic system according to the invention.

In the present embodiment, an appliance 10 includes a central processing unit (CPU) 12 which can connect to a client computer 20. An example of a suitable computer 20 is a Nokia 9000i Communicator. The Communicator includes an infra-red digital adaptor (IRDA) 22 including a receiver 23 and a transmitter 24 capable of bi-directional wireless communication.

In the simplest embodiment of the invention, the appliance 10 includes a transmitter 14 connected to the CPU 12, enabling uni-directional communication from the appliance 10 to the client 20. Although not essential for the present invention, the appliance transmitter 14 may form one part of an IRDA 16 also including a receiver

15. Usually remote controlled appliances, such a televisions or video recorders include an infra-red receiver connected to a micro-processor and as such it will be seen that the addition of a transmitter 14, should not add greatly to manufacturing costs of such appliances, enabling them to perform as transceivers capable of transmitting information as well as receiving remote control commands.

In any case, the invention is not limited to wireless communication between the client 20 and the appliance 10. Other client computers 20 may connect to appliances 10 via respective conventional RS-232 serial or parallel ports in the client and appliance. Nonetheless, the connection between client and appliance should be kept as simple as possible, as it is expected that the connection will only be used infrequently for fault diagnosis, and so should not add unduly to the cost of the appliance. The connection should also be highly reliable to ensure that in fault situations the CPU 12 is at least able to communicate externally with the client 20.

Within the appliance 10, the CPU 12 may be connected to one or more sensors 1..n, whose status the CPU monitors. The CPU may also be connected to other peripheral devices (not shown) whose status it can determine to identify a fault. For example, the CPU could continually poll peripheral devices such as amplifier chips, so that, if an amplifier chip blew and failed to respond to polling, the CPU could report this as a fault. More sophisticated peripherals may be able to report more subtle faults, so that the CPU could determine if the devices were working at less than 100% efficiency.

In the case of a fault, either detected by a sensor or in a peripheral device connected directly or indirectly to the CPU, the CPU may either continually transmit the identity of the fault via the transmitter 14, or it may wait for some kind of input, such as pressing a button on the appliance, or it may wait to receive a prompt via the receiver 15 before transmitting the identity of the fault.

The client computer 20 includes an interface program 25 which communicates via the IRDA adaptor 22 with the appliance 10. The interface program either prompts the appliance 20 via the IRDA transmitter 24 to send out a fault identify, and/or it can continually monitor the IRDA receiver 23 to determine the fault identity.



In the preferred embodiment, once the interface program 25 receives a fault identity, the program 25 launches a browser program 27 installed on the client 20 with an appropriate URL associated with the fault identity. The browser 27, if not already connected, connects via a modem 28 and a GSM (Global System for Mobile Telecommunications) network 29 to an Internet service provider (ISP) 30. The ISP 30 establishes a logical link between the client 20 and a web server 40 identified by the URL.

The fault identity provided by the appliance 10 can be in any number of formats. It can include a complete Internet URL identifying a web page including diagnostic information required by the technician. When such a URL identifies a page of information directly, then this page is returned to the browser 27 and is displayed on the client computer display for the technician. The information can of course take many forms, and could for example, include any type of multi-media information capable of being presented to the technician by the client computer 20. The technician can of course use hyper-links typically included in the web page to jump to other pages of interest to help in the final diagnosis and repair of the fault. The information could include an applet which may provide a front end for an expert system type diagnosis, although the details of such applets are not relevant to the present invention.

Alternatively, the interface program 25 may be associated with a database 26 including a list of web pages, each having a fault identity as an index key. In order to minimise the required number of TCP/IP addresses, a CGI-BIN type web server could be used. In this case, the URL supplied from the appliance 20 or via the database 26, would include the fault identity "fault\_ID" as a parameter in a URL of the following format:

"http://domain/path/diagnose.cgi-bin/fault\_ID"

When the client 20 connects to the web server 40 identified by "domain", a controller 42 on the web server reads the URL and calls a program called "diagnose", which resides in a directory "path", with "fault\_ID" as a parameter. The diagnose program would typically use the "fault\_ID" as an index key within a database 44 to retrieve diagnosis information from the database. This diagnosis information would normally be a page of information in HTML format which is returned to the client

computer 20, although the invention is not limited to this type of information.

5 In an alternative embodiment, the interface program 25 could connect via the modem 28 directly to an appliance manufacturer's computer, rather than to the manufacturers web server 40. This, however, would be a less reliable form of access to the diagnosis information and would rely on all manufacturers conforming to one version of interface program 25.

10 In a further embodiment of the invention, the diagnosis information could also include software which can be downloaded from the server 40 to the client 20 and subsequently downloaded to the appliance 10. In such an embodiment, the software running on the appliance 10 would need to be  
15 stored in an electrically erasable flash memory 17 to be updated by data received at the receiver 15.

20 This means that the invention could not only be used to fix faults in appliances by adding a patch to the appliance software, but the invention could also be used to upgrade functional appliances with added value software. In this case, the fault identity of the previous embodiments could comprise a version number of the software installed in the appliance 10. The client 20 could then determine from the version number if or to what extent the software was to be upgraded according to  
25 the information received from the web server.

30 A similar technique is currently used for upgrading software in modems where modem manufacturers have not been able to include software compatible with future standards when selling their equipment. However, modems are usually included in computers which connect to the Internet, as distinct from the appliances 10 for use with the current invention which would not normally have connections to the Internet.

35 It will also be seen that client computers 20 wishing to employ the above invention can both initially obtain the interface program 25 and the database 26 themselves or have this software upgraded with new information across the Internet.

## CLAIMS

1. A diagnostic system for an appliance comprising a device adapted to receive input data from an appliance, said input data defining a status of the appliance, the device including means adapted to generate a network address from said input data and means adapted to establish a connection to said network address, to retrieve information associated with the status of the appliance from said network address and to present said information.

2. A diagnostic system as claimed in claim 1 wherein the input data is in the form of a Internet web page address and the means for establishing a connection to the web page address is a web browser.

3. A diagnostic system as claimed in claim 1 wherein the device is adapted to transmit output data to the appliance.

4. A diagnostic system as claimed in claim 1 wherein said information includes software adapted to be executed in said appliance, and said device is adapted to transmit said software to said appliance.

5. A diagnostic system as claimed in claim 1 wherein said input data includes a fault identity, and said means adapted to generate a network address includes a database adapted to store a plurality of objects, each object being indexed by a said fault identity and including an attribute comprising a network address corresponding to the fault identity.

6. An appliance cooperable with the diagnostic system of claim 1.

7. A web server cooperable with the diagnostic system of claim 1 and comprising a database adapted to store a plurality of objects, each object being indexed by a key related to the status of the appliance and including an attribute comprising information relating to the status of the appliance.

8. A method of diagnosing a fault in an appliance comprising the steps of:

receiving input data defining a status of the appliance;

generating a network address from said input data;

establishing a connection to said network address;

retrieving information associated with the status of the appliance  
from said network address; and

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presenting said information.

9. An interface module for an appliance diagnostic system, said module  
being adapted to receive input data from an appliance, said input data  
defining a status of the appliance, the interface module being adapted to  
generate a network address from said input data and to launch a  
connection to said network address so that information associated with  
the status of the appliance can be retrieved from said network address  
and presented.

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